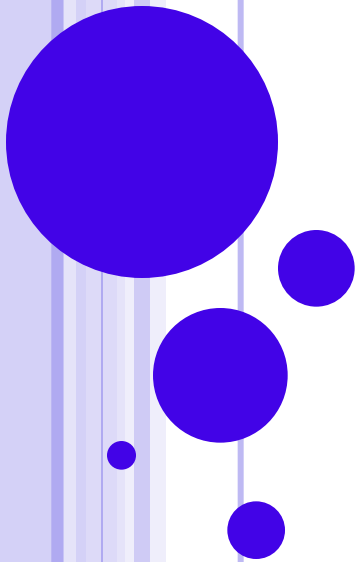


NUMBER SENSE



REFLECTING ON NUMBER SENSE

- Go to mscsummercourses2013.wikispaces.com and then to the number sense page.
- Respond to the discussion prompt “Number Sense.Pittsburgh Public Grades 3-5”.



REFLECTION

- How might visual models such as dot cards and ten-frames help to develop students' sense of number?
- How has your thinking changed about number sense?



AGENDA

- Response to wiki prompt
- Learning Progressions and Number Sense
- Do these children have number sense? – videos
- Number Talks
- Games to Develop Number Sense
- Article discussion
- Planning

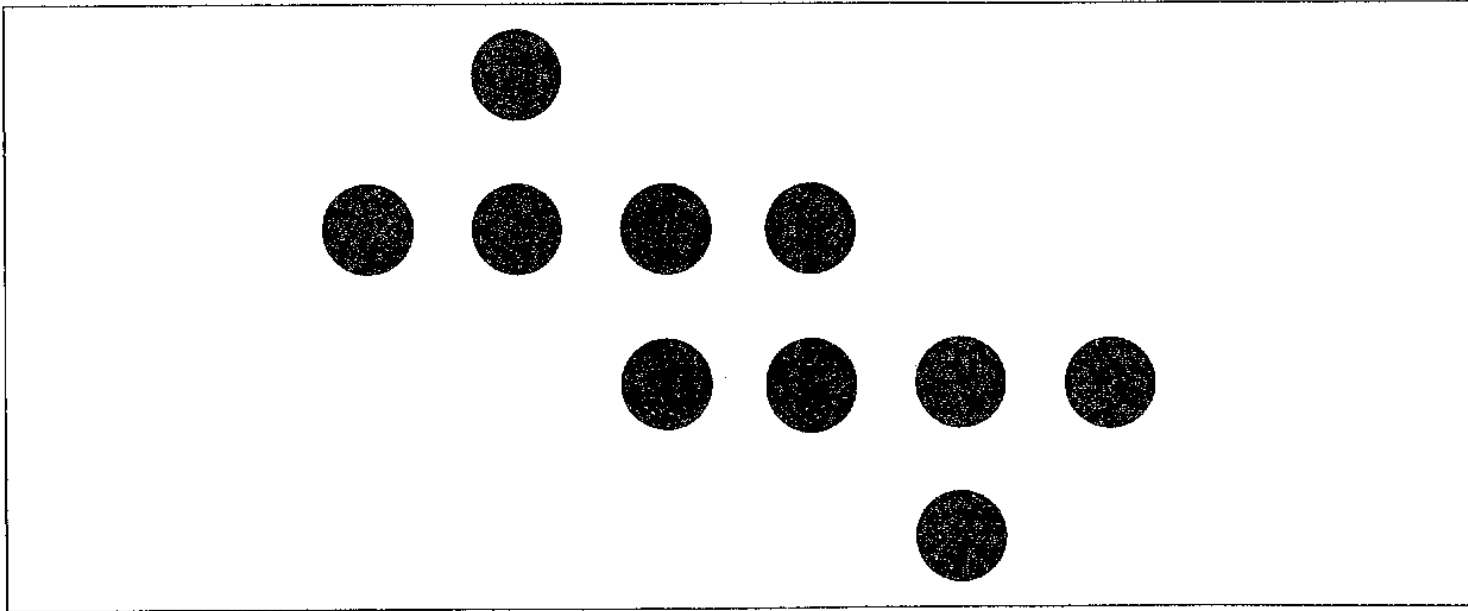


LEARNING PROGRESSION: K-5 NUMBER AND OPERATIONS IN BASE TEN

- Read the learning progression for the grade level assigned to you.
 - Make note of how it is connected to number sense, specifically, composing and decomposing numbers.

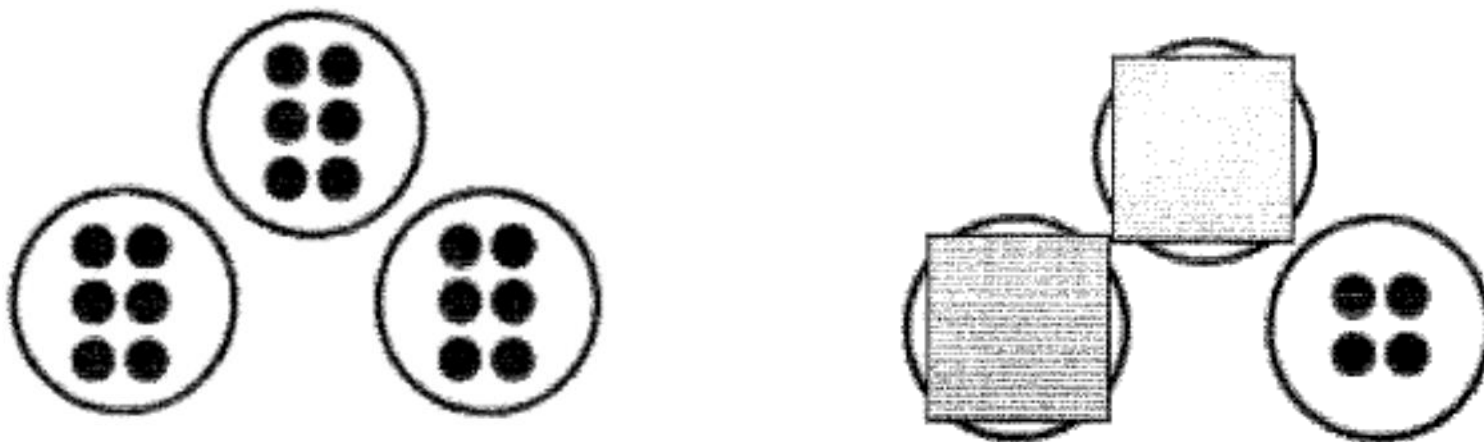


DOT CARDS- PRECURSORS TO NUMBER TALKS

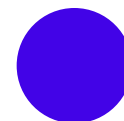


Highlights arrangements of quantities

HOW ARE THESE CARDS DIFFERENT?



Review the cards with your table partners. Where might you begin with 3rd grade? 4th or 5th grade? When do you introduce the “covered” cards? **How might you sequence the cards to build conceptual understanding?**



GET READY TO THINK...

- As you solve this problem, think about the strategy that you are using

$$32 \times 15$$



WHAT JUST HAPPENED?

- How was what we just did different than what usually happens in math class when computation is performed?
- What moves did you notice the facilitator doing?
- What did you notice about how you felt as a learner?



WHAT IS A NUMBER TALK?

A Number Talk is a five to fifteen minute classroom conversation around **purposefully crafted computation** problems that are solved mentally...focused on making sense of mathematics.

- Sherry Parrish. *Number Talks*. 2010



ESSENTIAL COMPONENTS

1. Classroom Environment and Community
2. Classroom Discussions
3. Teacher's Role
4. Role of Mental Math
5. Purposeful Computation Problems



GOALS FOR NUMBER TALKS

Grades K-2	Grades 3-5
Number Sense	Number Sense
Fluency	Fluency
Subitizing	Place Value
Make Tens (place value)	Properties
	Connect ideas



NUMBER SENSE

- Number sense is an awareness and understanding about what numbers are, their relationships, their magnitude, the relative effect of operating on numbers, including the use of mental mathematics and estimation

- Fennell and Landis (1987)



FLUENCY

- Accuracy – producing a correct answer
- Efficiency – choosing an appropriate, expedient strategy for the problem at hand
- **Flexibility** – using relationships with ease; understanding or using differing strategies

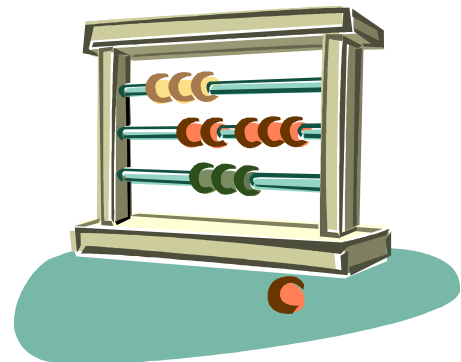


SUBITIZING

- Immediately knowing how many items lie within the visual scene
- Immediately recognizing a collection of objects as a single unit



X	X	X	X	



32 X 15

- What examples support the strong learning community that exists in the classroom?
- What evidence is there that students were using number sense to solve the problem?
- What strategy closely resembles the standard algorithm? How are they similar? Different?
- The distributive property is interwoven in most of the students' strategies. What examples do you notice of this property being used?
- Choose one of the strategies to model with an open array.

NUMBER TALK: GRADE 3

DO THESE STUDENTS HAVE NUMBER SENSE?

70 - 59

- How does the number line provide support for understanding *Grant's Constant Difference* strategy? In what other ways could you model this strategy to help students understand why it works?
- The students share several subtraction strategies: *Constant Difference, Adding Up, Removing in Chunks, and Adjusting One of the Numbers*. Discuss how these strategies are similar and different?
- When Andrew shared his strategy, students were unsure whether 1 should be added or subtracted. Share your observations about the student and teacher roles during the class discussion. How could you help students understand his thinking?
- Is there any evidence that students were engaged in the Standards for Mathematical Practice?



WHY HAVE STUDENTS TALK IN MATH CLASS?

- Talk can reveal understanding and misunderstanding
- Supports robust learning by boosting memory
- Supports deeper reasoning
- Supports language development
- Supports development of social skills



WHY HAVE STUDENTS TALK IN MATH CLASS?

- Can be a good form of *formative assessment* (assessment for learning) for you
- Can increase students' metacognitive abilities (thinking about how they think)
- Memory enhanced by the social significance of student-to-student dialogue
- Can even teach patience and acceptance of others and their ideas



MENTAL MATH

- When students solve a problem in their heads, they usually use what they know about place value, number relationships, patterns, and visual images to figure it out.
 - Problem context
 - Naked numbers



MENTAL MATH GRADE 5

- **1000 - 674**
- How is number sense used to determine whether an answer is reasonable or not?
- What purpose is served by the teacher accepting both correct and incorrect answers for the problem?
- How is the students' role different from typical classrooms?
- Often subtraction is explained as “taking away.” Cole’s strategy does not remove or take away an amount; instead, he adds to solve the problem. Why does this work?
- Is there any evidence that students were engaged in the Standards for Mathematical Practice?



IMPLICATIONS FOR TEACHING AND LEARNING

- What kinds of activities do you think these children were engaged in prior to these lessons?
- What evidence is there that they used these tools prior to the lessons we viewed?



COMMUNITY OF LEARNERS

- Building a strong and supportive community of learners is essential in making number sense routines beneficial and productive for everyone.
 - Students share out thinking
 - Students are active listeners
 - Work through misunderstandings in front of peers
 - Have time to think for themselves



GAMES TO DEVELOP NUMBER SENSE

Close to 1,000

Product Game

Play each of the games. After you play each game, answer the following questions:

- What concept(s) is the focus of each game?
- What tools might students use to support to solve the problems?
- Discuss the strategies students might use. Might they reason with facts they know?? How might you promote the use of more efficient strategies?
- Is there any way to adapt these games for older students to play?



GAMES TO DEVELOP NUMBER SENSE

- What evidence will you look for to see if students understand the underlying mathematics of the game?
- What evidence will you look for to see if students are using number sense as they play the game?



GAME EXPERT

For the game assigned to your group, be prepared to discuss:

- Concept that is focus of game
- Strategies students might use
- Ways to determine if students are engaged in mathematics
- Questions you might ask students as they are playing the game



WHAT IS NUMBER SENSE?

- Take a few minutes to jot down a few thoughts about what number sense is. Fill in the left side of your sheet.

I think number sense is ...	But now I know it is ...

ASSIGNMENT

- Read pages 119-134 in Number Sense Routines book.

Guiding Question:

What would a strong community of learners look and sound like? What is one thing you will do to make your community of learners stronger?

- Plan task focusing on one standard and one standard for math practice involving the use of visuals to develop/extend number sense.
 - Include a mental math activity and a game.

